Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] A dome resonator comprising:
a resonator circuit exciting or receiving radio frequency magnetic resonance signals in a region of interest and having a plurality of longitudinal conductive elements coupled at a first end and a second end and tapering from said first end to said second end;
a resonator circuit support coupled to and supporting said resonator circuit; and
a shield coupled to said resonator circuit support and electrically isolating said resonator circuit from a surrounding environment.

[c2] A resonator as in claim 1 wherein said resonator circuit excites and receives radio frequency magnetic resonance signals in a region of interest.

[c3] A resonator as in claim 1 wherein said resonator circuit further comprises a plurality of capacitive elements.

[c4] A resonator as in claim 1 wherein said second end is in a form of an apex.

[c5] A resonator as in claim 1 wherein said resonator circuit performs in a configuration selected from at least one of

a low pass configuration, a high pass configuration, a hybrid configuration, and a transverse electromagnetic configuration.

[c6] A resonator as in claim 1 wherein said resonator circuit support is a support lamina.

[c7] A resonator as in claim 1 wherein said shield prevents susceptibility to determined frequencies.

[c8] A resonator as in claim 1 wherein said shield is coupled to said resonator circuit support approximately within an apex area.

[c9] A resonator as in claim 1 wherein said shield is formed of a material selected from at least one copper, silver, and a non-magnetic conductive material.

[c10] A resonator as in claim 1 wherein said shield is supported by an insulating shield support that is coupled to said resonator circuit support.

[c11] A resonator as in claim 10 wherein said insulating shield support is coupled to said resonator circuit support approximately within an apex area.

[c12] A resonator as in claim 10 wherein said insulating shield support is directly coupled over said resonator circuit to said resonator circuit support.

[c13] A resonator as in claim 10 wherein said insulating shield support is only coupled to said resonator circuit support approximately within an apex area.

[c14] A resonator as in claim 10 wherein said resonator circuit support and said insulating shield support is formed of a material selected from at least one of plastic, fiberglass, resin, polyurethane, lexan, wood, and a rigid insulating material.

[c15] A resonator as in claim 1 wherein said shield tapers from said first end to said second end.

[c16] A resonator as in claim 1 wherein distance between said shield and said resonator circuit decreases from said first end to said second end.

[c17] A resonator as in claim 1 wherein distance between said shield and said resonator circuit uniformly decreases from said first end to said second end.

[c18] A resonator as in claim 1 wherein said shield and said resonator circuit have a tapering distance therebetween that is selected to produce a spatially uniform radio-frequency magnetic field within an interior space bounded by said resonator.

[c19] A resonator as in claim 1 wherein the resonator is in a

shape configuration selected from at least one of an ellipsoidal configuration, a paraboloidal configuration, and a symmetrical configuration.

[c20] A magnetic resonance imaging system comprising:
a magnet structure having a super conducting magnet generating and applying a series of magnetic field gradient pulses across a region of interest;
a dome resonator comprising;
a resonator circuit exciting or receiving radio frequency magnetic resonance signals emanating from said region of interest and having a plurality of longitudinal conductive elements coupled at a first end and a second end and tapering from said first end to said second end;
a resonator circuit support coupled to and supporting said resonator circuit; and
a shield coupled to said resonator circuit support and electrically isolating said resonator circuit from a surrounding environment; and
a signal processing system coupled to said dome resonator and reconstructing an image for said region of interest in response to said radio frequency magnetic resonance signals.

[c21] A method of designing and manufacturing a dome resonator comprising:
determining desired performance parameters for the

dome resonator;
determining design parameters of a resonator circuit and of a shield in response to said desired performance parameters;
generating a set of exemplary plots in response to said design parameters;
generating a plurality of flux plots using conformal mapping in response to said set of exemplary plots;
determining whether said flux plots satisfy said desired performance parameters; and
adjusting said design parameters until said desired performance parameters are satisfied.

[c22] A method of reconstructing an image within a magnetic resonance imaging system having a dome resonator comprising:
generating and applying a series of magnetic field gradient pulses across a region of interest;
electrically isolating said resonator circuit from a surrounding environment;
attenuating field strength within the dome resonator via a shield;
receiving radio frequency magnetic resonance signals emanating from said region of interest via a resonator circuit of the dome resonator; and
reconstructing an image for said region of interest in re-

sponse to said radio frequency magnetic resonance signals.